INdAM Intensive research period

Perspectives in Lie Theory

Abstracts

Session 2: Winter School: Lie Theory and Representation Theory

This session is organized in the framework of the Summer and Winter Schools of the University of Padova.

A Super Quantum Lie Day

Poster Session

Giulio Codogni *SUSY curves and their moduli*

SUSY curves are 1|1 super manifold endowed with a particular distribution. Their moduli space is particularly relevant in superstring theory. In this poster I will present some basic properties of SUSY curves, as well as some recent results about their canonical model and their periods. One aim is to provide an insight into the moduli space.

Tiffany Covolo *Trace and Berezinian over $(\mathbb{Z}_2)^n$-commutative algebras.*

A $(\mathbb{Z}_2)^n$-commutative algebra (sometimes called color (super)algebra) is an associative $(\mathbb{Z}_2)^n$-graded algebra in which multiplication satisfies the generalized sign rule $ab = (-1)^{\langle \deg(a), \deg(b) \rangle} ba$ (for any pair of homogeneous elements a, b), where $\langle ., . \rangle$ denotes the usual scalar product. Notably, these algebras include supercommutative algebras ($n = 1$), and remarkable classical noncommutative algebras, such as quaternions and Clifford algebras. In this poster, I present three alternative approaches to obtain generalizations of notions of (super)determinant and trace in this higher graded setting: a direct approach via quasideterminants, a cohomological approach, and a categorical approach.

Rita Fioresi *Supersymmetric spaces*

We want to discuss the highest weight representations of the $(\mathfrak{g}_r, \mathfrak{k}_r)$ pair consisting of $\mathfrak{g}_r$, a real form of a complex Lie superalgebra of classical type $\mathfrak{g}$, and the maximal compact subalgebra $\mathfrak{k}_r$ of $\mathfrak{g}_{r,0}$. These representations will be concretely realized through spaces of holomorphic vector bundles on the associated Hermitian superspaces.

Fabio Gavarini *Affine Supergroups vs. Super Harish-Chandra Pairs*

I present a new method to associate a "split" affine supergroup with any super Harish-Chandra pair (=sHCp), that provides an equivalence of categories between sHCp's and (split) affine supergroups. Namely, I provide a new functorial construction that, with each super Harish-Chandra pair, associates a split affine supergroup: this functor is then proved to be a quasi-inverse to the natural functor from (split) affine supergroups to super Harish-Chandra pairs, so the two yield equivalences between the corresponding categories. The existence of similar equivalences was known (possibly in different contexts, such as the smooth or the complex analytic one), but the construction I present is actually new - the quasi-inverse functor that I introduce is different - and extends the result to a much larger setup, with a totally different, more geometrical method.
Reference: arXiv:1308.0462, to appear in "Transactions of the AMS"

Stephen Kwok *SUSY structures, representations and the Peter-Weyl theorem for* $S^{(1|1)}$

We study the real supergroup $S^{(1|1)}$ and its representation theory from various perspectives. We prove that it is the unique (up to isomorphism) real form of $(\mathbb{C}^{(1|1)})^\times$ with reduced group S^1, and relate it to SUSY-structures. We also show complete reducibility for $S^{(1|1)}$ representations whose weights are all nonzero, and use this to prove the Peter-Weyl theorem for $S^{(1|1)}$. This is joint work with C. Carmeli (Genoa) and R. Fioresi (Bologna).

Marc-Antoine Leclerc *A Hyperbolic Formal Affine Demazure Algebra for a Kac-Moody Root System*

In a recent paper in 2013, A. Hoffnung, J. Malagon-Lopez, A. Savage and K. Zainoulline constructed a generalization of a Hecke algebra starting from a formal group law and a finite root system. In this poster we discuss how to generalize their construction to a Kac-Moody root system in the case of a hyperbolic formal group law. This is joint work with E. Neher and K. Zainoulline.

Mathieu Mansuy *Representations of quantum toroidal algebras*

We construct new integrable representations of quantum toroidal algebras (double affinization of quantum groups), called extremal loop weight representations. Their definition is given by Hernandez in 2009, following the one of extremal weight representations of quantum affine algebras by Kashiwara. The aim, like in the works of Kashiwara, is to construct finite-dimensional representations of the quantum toroidal algebras, but at roots of unity in this case.